

CALIBRATION STANDARD REQUIREMENT  
FOR A  
SYNTHESIZED SIGNAL GENERATOR  
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PROCUREMENT PACKAGE

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CALIBRATION STANDARD REQUIREMENT FOR A  
SYNTHESIZED SIGNAL GENERATOR

1. SCOPE

1.1 Scope. This requirement defines the mechanical, electrical, and electronic characteristics for a Synthesized Signal Generator. This equipment is intended to be used by Navy personnel in shipboard and shore based laboratories to calibrate various Weapon Test Sets and associated Test and Monitoring Systems (TAMS). For the purposes of this requirement, the Synthesized Signal Generator shall be referred to as the SSG.

2. APPLICABLE DOCUMENTS

2.1 Controlling Specifications. MIL-T-28800, "Military Specification, Test Equipment for use with Electrical and Electronic Equipment, General Specification for," and all documents referenced therein of the issues in effect on the date of the solicitation shall form a part of this requirement.

3. REQUIREMENTS

3.1 General. The SSG shall conform to Type II, Class 5, Style E requirements as specified in MIL-T-28800 for Navy shipboard and shorebased use as modified below. The use of material restricted for Navy use shall be governed by MIL-T-28800.

3.1.1 Design and Construction. The SSG design and construction shall meet the requirements of MIL-T-28800 for Type II equipment.

3.1.2 Power Requirements. The SSG shall operate from a source of 103.5V to 126.5V at 60 Hz 5% single-phase input power as specified in MIL-T-28800.

3.1.2.1 Fuses or Circuit Breakers. Fuses or circuit breakers shall be provided. If circuit breakers are used, both sides of the power source shall be automatically disconnected from the equipment in the event of excessive current. If fuses are used, only the line side of the input power line as defined by MIL-C-28777, shall be fused. Fuses or circuit breakers shall be readily accessible.

3.1.2.2 Power Connection. The requirements for power source connections shall be in accordance with MIL-T-28800 with a 6-foot (1.8 meter) minimum length cord.

3.1.3 Dimensions and Weight. Maximum dimensions shall not exceed 17 inches (43.2 cm) in width, 6 inches (15.3 cm) in height, and 22 inches (55.9 cm) in depth. The weight shall not exceed 35 pounds (16 kg).

3.1.4 Lithium Batteries. Per MIL-T-28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

3.2 Environmental Requirements. The SSG shall meet the environmental requirements for Type II, Class 5, Style E equipment with the deviations specified below.

3.2.1 Temperature and Humidity. The SSG shall meet the conditions below:

	<u>Temperature (°C)</u>	<u>Relative Humidity (%)</u>
Operating	10 to 30	95
	30 to 40	75
Non-operating	-40 to 70	Not Controlled

3.2.2 Electromagnetic Compatibility. The electromagnetic compatibility requirements of MIL-T-28800 are limited to the following areas: CE01, CE03, CS01, CS02, CS06, RE01, RE02 (14 kHz to 1 GHz), and RS03.

3.3 Reliability. Type II reliability requirements are as specified in MIL-T-28800.

3.3.1 Calibration Interval. The SSG shall have an 85% or greater probability of remaining within tolerances on all requirements at the end of a 12 month period.

3.4 Maintainability. The SSG shall meet the Type II maintainability requirements as specified in MIL-T-28800 except the lowest discrete component shall be defined as a replaceable assembly. Certification time shall not exceed 180 minutes.

3.5 Performance Requirements. The SSG shall provide the following capability as specified below. Unless otherwise indicated, all specifications shall be met following a 30 minute warm-up period and apply for the output frequency range of 85 to 1120 MHz.

3.5.1 Frequency.

3.5.1.1 Frequency Range. The minimum frequency range shall be from 85 MHz to 1120 MHz.

3.5.1.2 Frequency Resolution. The frequency resolution shall be at least 10 Hz.

3.5.1.3 Frequency Stability Requirements. The SSG shall meet the following frequency stability requirements.

3.5.1.3.1 Aging Rate. The SSG aging rate (frequency drift) shall not exceed  $\pm 1 \times 10^{-9}$  per day.

3.5.1.3.2 Warm-up. The warm-up period shall be not exceed 30 minutes for the final frequency to be within  $\pm 1.5 \times 10^{-8}$ .

3.5.1.4 External Reference. The SSG shall have the capability of operating from an external frequency standard with frequencies of 1, or 10 MHz and having an amplitude of at least 0.3 V peak to peak.

3.5.1.4.1 Input Impedance. The input impedance of the external frequency shall be a 50 ohms nominal.

3.5.1.5 Reference Output. The SSG shall have the capability of supplying a standard frequency output of 10 MHz, with an output amplitude of at least 0 dBm into 50 ohms via a BNC connector.

3.5.2 Output Amplitude.

3.5.2.1 Output Amplitude Range. The output amplitude range shall be at least -13 to -127 dBm.

3.5.2.2 Amplitude Resolution. The resolution of the output amplitude shall be at least 1.0 dB.

3.5.2.3 Amplitude Accuracy. The accuracy of the output amplitude shall not exceed  $\pm 2.0$  dB.

3.5.2.4 Output Impedance. The output impedance of the signal output shall be a nominal 50 ohms.

3.5.2.5 Output VSWR. The output SWR shall not exceed the following:

<u>VSWR</u>	<u>Amplitude</u>
1.5	<+1 dBm
2.0	>+1 dBm

3.5.2.7 Reverse Power Protection. The SSG shall have a reverse power protection capability up to 25W or 30 Volts DC from a 50 ohms source.

3.5.2.8 Amplitude Switching Speed. The amplitude switching time shall not exceed 200 milliseconds.

### 3.5.3 Spectral Purity.

3.5.3.1 Residual FM. The residual FM in CW or AM less than 1/3 maximum peak deviation shall not exceed the following:

Frequency Range (MHz)	Post Detection 300 Hz to 3 kHz	Bandwidth 50 Hz to 15 kHz
85 to 245	12 Hz rms	18 Hz rms
245 to 512	6 Hz rms	9 Hz rms
512 to 1120	12 Hz rms	18 Hz rms

3.5.3.2 Residual AM. Residual AM shall be less than -60 dBc when measured in a 0.05 to 15 kHz bandwidth.

3.5.4 Spurious Response. The harmonics, subharmonics, and non-harmonics shall not exceed the following:

	Levels
Harmonics	<-25 dBc
Subharmonics	<-60 dBc
Non-harmonics	<-60 dBc

3.5.5 Amplitude Modulation (AM). The AM depth shall be from 0 to 99.9% in 1% steps, with an output level of at least +10 dBm.

3.5.5.1 AM Accuracy. The AM accuracy of the SSG shall not exceed  $\pm 2\% + 4\%$  of setting.

3.5.5.2 AM Distortion. The AM total harmonic distortion (THD) shall not exceed 5%.

3.5.5.3 Incidental FM. The incidental FM shall be less than  $0.6f_m$  at internal rates and less than 30% AM.

3.5.5.4 Internal Modulation Rates. The SSG shall have AM internal modulation rates of 400 Hz and 1 kHz.

### 3.5.6 Modulation Source.

3.5.6.1 Internal and External Modulation. The SSG AM modulation shall have the capability of being driven with either internal or external modulation sources.

3.5.6.2 Input Impedance. External modulation input impedance shall be 600 ohms or greater.

3.5.6.3 External Modulation Display. The external modulation input signal shall be a nominal 1 V peak for required accuracy.

3.6 Operating Requirements. The SSG shall provide the following operating capabilities.

3.6.1 Front Panel Control Requirements. All modes and functions shall be operable using front panel controls. The locations and labeling of indicators, controls, and switches shall provide for maximum clarity and easily understood operation without reference to tables, charts, or flow diagrams.

3.6.2 Programmability. All modes and functions shall be fully remotely programmable via the IEEE-488.1 instrumentation bus. When operating the SSG via remote programming, all front panel controls shall be disabled, except for the on / off switch and the Remote / Local switch.

3.6.3 Error Correction. During calibration, the SSG shall provide the capability to correct for all measurement deviations from nominal conditions. This correction capability shall be operational from the front panel control, manual adjustment to printed circuit board, or over the IEEE-488 bus. The SSG shall be capable of changing any calibration factor or other correction data stored in memory of the SSG without removal of any memory circuits or devices. The calibration constants may be changed only if a switch (not a key switch) on the rear panel is enabled.

3.6.4 Local / Remote. The SSG shall have a local and remote operation mode. It shall be either manually or remotely programmable selectable according to paragraph 3.6.2. Manual selection shall be provided by a front panel switch. A means of indicating the operational mode shall be provided. When changing modes, all parameter values shall remain unchanged.

3.6.5 Self-Test. The self-test shall comprise two selectable levels, an operational test to determine if the instrument is operationally ready, and second level diagnostic test to diagnose and isolate faulty field replaceable modules. When the self-test function is initiated, an auto-sequenced internal operation test shall be performed. The diagnostic test shall be selectable only by deliberate operator command.

3.6.6 IEEE Interface. The SSG shall have an IEEE-488.1 interface connector with the following capabilities: SH1, AH1, T6, L4, SR1, RL1, DT1. Serial poll capability shall be provided.

3.6.7 Display. The SSG shall have the capability of digitally displaying output units of V, mV,  $\mu$ V, and dBm.

3.7 Manual. At least two copies of an operation and maintenance manual shall be provided. The manual shall meet the requirements of MIL-M-7298.

3.7.1 Calibration Procedure. The manual shall provide a SSG calibration procedure in accordance with MIL-M-38793.